

CLAIMS

1. A child resistant closure cap for a container, said cap including:
an electrical generation means for generating and storing electrical energy;
at least one sensing means, being energised by said electrical generation means, for detecting the biometric attributes of a user attempting to remove said cap; and
a latching means operable by said at least one sensing means, for releasably securing said child resistant closure cap to a container, in use.
2. A child resistant closure cap as claimed in claim 1, wherein said electrical generation means further comprises a piezoelectric element.
3. A child resistant closure cap as claimed in claim 2, wherein said piezoelectric element is formed from a suitable piezoceramic material or polyvinylidene fluoride film.
4. A child resistant closure cap as claimed in any of claims 2 or 3, wherein said electrical generation means further comprises a ratchet-type mechanism for producing a repeatable dynamic force on said piezoelectric element.
5. A child resistant closure cap as claimed in claim 4, wherein said ratchet-type mechanism further comprises a piezoelectric element located on a substrate or support plate which can turn freely within the child resistant closure cap.
6. A child resistant closure cap as claimed in claim 5, wherein said ratchet-type mechanism further comprises a knob mounted on top of said child resistant closure cap and the action of rotating said knob causes the substrate or support plate to meet with a number of deflection nodules located

at regular intervals inside the periphery of said cap, causing said support plate to be repeatedly flexed and deformed, which produces a large, regular dynamic force on said piezoelectric element.

7. A child resistant closure cap as claimed in any of claims 2 or 3, wherein said electrical generation means further comprises a flexible piezoelectric element mounted on a support plate, which is located inside a two-part child resistant closure cap.

8. A child resistant closure cap as claimed in claim 7, wherein one end of the flexible piezoelectric element and support plate is fixed in one section of the cap and the other end of the flexible piezoelectric element and support plate is fixed in a second movable section of the cap.

9. A child resistant closure cap as claimed in claim 8, wherein the action of aligning both sections of the two-part cap causes the flexible piezoelectric element to be flexed and distorted which produces a large electrical output.

10. A child resistant closure cap as claimed in any of claims 2 or 3, wherein said electrical generation means further comprises a piezoelectric element interposed between two steel sections substantially formed as a flat circular disc.

11. A child resistant closure cap as claimed in claim 10, wherein said piezoelectric element and steel sections are located on a number of support elements which are positioned at regular intervals inside the periphery of the child resistant closure cap.

12. A child resistant closure cap as claimed in claim 11, further comprising an axle with a nut located thereon situated above the disc and the action of rotating the nut above said circular disc in turn deflects the piezoelectric element and steel sections which generates a large electrical output.

13. A child resistant closure cap as claimed in any of claims 2 or 3, further comprising a two-part closure cap having an upper section which is free to rotate above a fixed section, via an undulating contact surface.

14. A child resistant closure cap as claimed in claim 13, further comprising a substantially T-shaped member which is connected to the inner periphery of the upper movable section of the cap which is situated above the piezoelectric element interposed between two steel sections substantially formed as a flat circular disc.

15. A child resistant closure cap as claimed in claim 14, wherein the action of rotating the upper section of the cap deflects the piezoelectric element and steel sections via the T-shaped member which generates a large electrical output.

16. A child resistant closure cap as claimed in claims 14 or 15, further comprising a resilient element interposed between the T-shaped element and the piezoelectric element.

17. A child resistant closure cap as claimed in claim 1, wherein said electrical generation means further comprises an electromechanical generator.

18. A child resistant closure cap as claimed in claim 17, wherein said electromechanical generator further comprises a coil linking a fixed magnetic field to produce electrical energy.

19. A child resistant closure cap as claimed in any preceding claim, wherein said electrical generation means further includes a plurality of photovoltaic cells for converting light energy into electrical energy.

20. A child resistant closure cap as claimed in any preceding claim, wherein said electrical generation means further comprises a self-winding mechanism, whereby the action involved in releasing and replacing said cap provides a sufficient electrical energy.

21. A child resistant closure cap as claimed in claim 1, wherein at least one sensing means is provided using at least one piezoelectric transducer which performs both functions of detecting the biometric attributes of said user and, by doing so, also generates and stores electrical energy by virtue of the piezoelectric effect.

22. A child resistant closure cap as claimed in claim 1, wherein said at least one sensing means further comprises a number of sensors mounted on and around said child resistant closure cap for detecting the biometric attributes of the hand and fingers of the user attempting to remove said child resistant closure cap.

23. A child resistant closure cap as claimed in any preceding claim, wherein said biometric attributes include finger length or finger thickness or any human dimensions that change with age.

24. A child resistant closure cap as claimed in any preceding claim, wherein the physical position of the sensors is such that a child or other minor would not be able to position his hand and fingers on all of the sensors simultaneously to operate the latching means.

25. A child resistant closure cap as claimed in claim 1, wherein said at least one sensing means further comprises at least one pressure transducer which can be implemented using at least one piezoelectric transducer.

26. A child resistant closure cap as claimed in claim 25, wherein said at least one piezoelectric transducer would also perform the function of said

electrical generation means and would be located on the same substrate as said electrical generation means.

27. A child resistant closure cap as claimed in claim 26, further comprising a substrate containing an array of piezoelectric transducers along with a surface storage capacitor forms an integral biometric sensor and electrical generation means and which could store and release sufficient electrical energy to operate the latching means.

28. A child resistant closure cap as claimed in any preceding claim, wherein said at least one sensing means may comprise at least one resistance, capacitance or conductivity sensor.

29. A child resistant closure cap as claimed in claim 1, wherein said at least one sensing means further comprises a proximity sensor to the term and the distance between the top of the cap and the hand crotch of the user.

30. A child resistant closure cap which, in use, is adapted to engage with a container, comprising:

at least one piezoelectric transducer for detecting the biometric attributes of a user attempting to remove said child resistant cap from said container, and thereby generating an electrical output; and

a latching means, being in connection with at least one piezoelectric transducer, for releasably securing said child resistant cap to said container.

31. A child resistant closure cap as claimed in any preceding claim, wherein said cap is adapted to engage with said container via a screw thread.

32. A child resistant closure cap as claimed in any preceding claim, wherein said cap is formed from polypropylene or molded from a suitable plastics material.

33. A child resistant closure cap as claimed in any preceding claim, wherein said cap has physical dimensions compatible with standard containers of pharmaceutical products, bleach or other products.

34. A child resistant closure cap as claimed in any preceding claim, wherein said latching means only allows user access to the contents of said container after verification of their biometric attributes.

35. A child resistant closure cap as claimed in any preceding claim, wherein said latching means comprises a spring-loaded pin which extends inwards inside the periphery of said cap.

36. A child resistant closure cap as claimed in claim 35, wherein in an unlocked position, the pin is retained inside the cap by use of an electromagnetic solenoid or piezoelectric actuator.

37. A child resistant closure cap as claimed in claim 35, wherein in a locked position, the pin extends outward into an aperture located in the container.

38. A child resistant closure cap as claimed in claim 35, wherein latching means will always 'fail-safe' as, in the absence of an electrical signal to the actuator, the spring-loaded pin is forced in the aperture and the cap cannot be removed.

39. A child resistant closure cap as claimed in any preceding claim, wherein said latching means is incorporated inside a two-part child resistant closure cap and includes a mechanism which extends between the inner and outer sections of said two-part cap.

40. A child resistant closure cap as claimed in claim 39, wherein in a locked position, the mechanism is such that the outer section of the cap does

not cooperate with the inner part of the cap which, in turn, is engaged to the screw thread of the container.

41. A child resistant closure cap as claimed in claim 39, wherein in an unlocked position, the mechanism is such that the inner and outer sections of the cap cooperate with each other and the user can unscrew the cap from said container.

42. A child resistant closure cap as claimed in any preceding claim, further comprising an audible sounder to warn that an unauthorised access by a child has been attempted.

43. A child resistant closure cap as claimed in claim 42, wherein said audible sounder further comprises an electromagnetic or piezoelectric sounder.

44. A child resistant closure cap for a container as described herein with reference to Figures 1 to 11 of the accompanying drawings.

45. A child resistant closure cap which, in use, is adapted to engage with a container as described herein with reference to Figures 1 to 11 of the accompanying drawings.